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The Analog Devices' **ADAM 200** *(All-Digital Answering Machine)* provides the software and hardware development environment to build several types of digital telephony products:

- Digital Answering Machine
  (reference design, software modules)

- Caller ID Products
  (software modules)

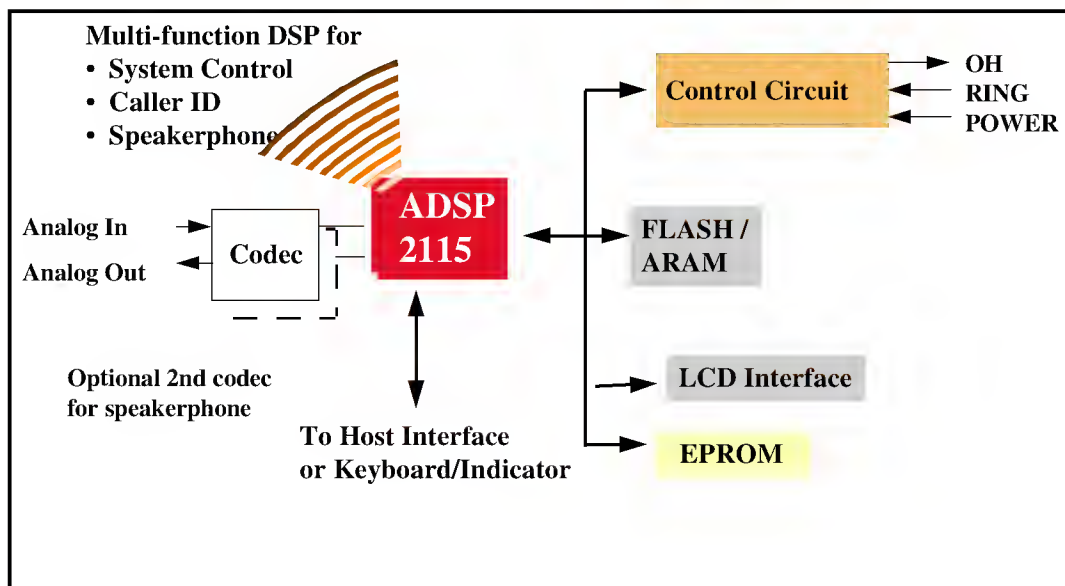- Full duplex Speakerphone Solution
  (software modules)

ADAM 200 also includes a complete reference design for an integrated Digital Answering machine/Speakerphone/Caller ID product.

With its included Analog Devices' high performance fixed-point DSP core, the ADAM 200 architecture provides the platform for multiple algorithms to be implemented on a single processor. This enables OEMs to eliminate discrete, single function implementations of algorithmic functions such as speech compression and DTMF generation. By providing a multi-functional set of software modules and designs, ADAM 200 provides the fast time-to-market design cycle that OEMs require to compete in today's quickly changing telephony market.

MULTI-FUNCTIONAL REFERENCE DESIGN FOR ANSWERING MACHINE/ SPEAKERPHONE/ CALLER ID:

The ADAM 200 development environment, with full Digital Answering Machine /Speakerphone /Caller ID capability, brings a fully functional, fully tested product reference design directly to the OEM. With 15 minutes of message storage available with a 4MByte Flash or ARAM memory chip, ADAM 200 does all speech compression, memory management telephone call progress monitoring and line control, and integration into peripherals on the DSP. Application functions for Answering Machine, Speakerphone and Caller ID are also done on the DSP without additional ASICs or microcontrollers.

Multi-function DSP for
- System Control
- Caller ID
- Speakerphone

Analog In
Analog Out
Codec
ADSP 2115
Optional 2nd codec for speakerphone
To Host Interface or Keyboard/Indicator

Control Circuit — OH, RING, POWER
FLASH / ARAM
LCD Interface
EPROM

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ANSWERING MACHINE USER FEATURES (User Application):

- Skip/Delete
- Record Outgoing Messages /Auto Dial Out, Broadcast
- Auto Dial To User-Programmed Number

- Scan
- Outgoing Message Changes
- Auto Transfer - to deliver messages to telephone number indicated

- Programmed Message Size (from 30 sec. to 2 mins.)
- Password and Call Breakthrough Code Change
- Room Monitoring

- Remote Turn-On
- Memory Dialing
- Play/Replay (new message only or all messages)

- Repeat
- Voice Memo
- Broadcast of Recorded Message up to 5 Recipients

- Pause
- Save
- Call Breakthrough/Emergency Calling (alerts called party to pick up phone)

- Volume Control (5 levels)
- Toll Saver
- Two-Way Record and Play

- Voice Clock
- Variable Speech Playback
- Call By Name Directory Feature (phonebook)
- Hand-Free Full Duplex Speakerphone

MEMORY TYPES SUPPORTED:

By supporting both ARAM and Flash memory in its design, this reference design provides OEMs with a choice of memory options for incoming messages. ADAM 200 has been designed to take advantage of the features of each type of memory, such as battery backup not required for the Flash design. In addition, among all available non-volatile memories, Flash memory is the smallest in physical size for a given memory. For Flash memory implementations, ADAM 200's design recommends a 4MByte NAND single supply flash, with a 4 MByte, 8MByte and 16MByte Flash using the same board layout. Opcode is stored in the Flash with no extra EPROM used.

FLASH SPECIFICATIONS

- Single +5 V power supply
- Byte-wide memory architecture
- Frame program mode
- Block Erase
- Burst Frame Access
- Command/address/data multiplexed I/O port
- >100K Program/erase Endurance cycle
- Serial Page Access: 80 ns
- Fast Write-cycle time: 250 ms
- No restrictions on where data is stored
- Needs additional SRAM to address Flash

ARAM SPECIFICATIONS

- 1M x 4 bit configuration
- Less than 90 ns access time
- 5 V operation
- Fast page mode support. Early read and early write operation
- RAS ONLY refresh support
- Minimum refresh cycle time of 8 milliseconds
- Any four error free rows (need not be in the beginning nor be consecutive)

ADAM 200's answering machine user interface can be customized to suit any number of buttons on the telephone key pad.

15-MINUTE MESSAGE RECORD TIME:

Using a GSM speech coder modified to offer optimal compression-to-quality ratio, ADAM 200 offers a 5.0 kbps modified GSM speech coder. Flexibility in ADAM 200 design results in greater amounts of speech storage by adding memory chips with larger memory capacity, within the same socket space on the ADAM reference design. Thus, OEMs can use the same ADAM 200 design for models with different message storage capabilities.

SPEAKERPHONE PRODUCTS:

The ADAM 200 development environment uses a standards-driven approach to its full-duplex speakerphone capabilities to ensure the highest quality available on the market:

LINE ECHO CANCELLATION:

Line Echo Cancellation in a digital answering machine ensures the correct detection of DTMF tones. ADAM 200's Line Echo Cancellation conforms to the G.165 standard and is implemented as an adaptive FIR filter with automatically adjustable coefficients.

ACOUSTIC ECHO CANCELLATION (AEC):

ADAM 200 supports AEC to ITU Standard 167 for Acoustic Echo Cancellation. The AEC includes 300 milliseconds of AEC span to enable implementation of full duplex speakerphone functionality, depending on the memory available.

DIGITAL AUTOMATIC GAIN CONTROL (AGC):

Digital Automatic Gain Control (AGC) regulates the amplitude of the speech signal for varying input signal levels to the desired threshold level set. This is achieved by scaling the incoming signal by a variable gain. The variable gain is calculated proportional to the difference between the threshold and the actual level of the signal in a closed loop manner. The time constant of the AGC (attack time) is kept large enough so that silence between two words, or if the speaker pauses momentarily, will not be amplified, thereby quieting line noise.

CALLING, DTMF AND FAX FUNCTIONS:

Fax CNG Detection	1100Hz (0.5 sec on / 3 sec off)
Dial Tone Detection	345 - 645 Hz, 8 sec ± 0.1sec
Busy Tone Detection	345 - 645 Hz, duty cycle 50 ± 5%
DTMF Encoder	12 Digits
DTMF Decoder	Advanced algorithm with ability to detect with speech superimposed

CALLER ID:

Meets specification for U.S. Bellcore 202 and BT (SIN 227, 242) for Caller ID.

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Analog Devices Software & Systems Technology division offers software modules individually, for license bundled with an Analog Devices component from the Software & Systems Technology Division. With these software modules, OEMs can integrate features such as speakerphone capability, speech compression modules (CELP and Modified GSM) or Caller ID into their own designs with a minimum of design effort.

LCD DISPLAY INTERFACE:

Driven from the DSP, the LCD display can be used for Caller ID, Speakerphone or Directory functions.

FULL REFERENCE DESIGN OR CUSTOMIZABLE DESIGNS:

ADAM 200 provides a fully featured answering machine reference design for OEMs who require a design that can go direct to manufacturing — ADAM 200 can also be customized to suit any OEM requirement. As a complete reference design, gerber files, diagrams and the ADAM 200 PC-based menu-driven development toolkit enable a designer to define system parameters, manage voice prompts and generate ROM-able code.

ORDERING INFORMATION

The **ADAM 200** product line includes chipsets for reference answering machine based reference designs, and chipsets for individual software modules. Chipsets include a fixed point DSP plus a software module and are available under the part numbers of ADSST-DAM-xxxx. For production purposes, a software license is required.

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